SYNOPSES OF NORTH-AMERICAN INVERTEBRATES.

XII. The Trematodes.

PART II.[1] — *THE ASPIDOCOTYLEA AND THE MALACOCOTYLEA, OR DIGENETIC FORMS.*

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The following are the families, subfamilies, and genera of the suborders Aspidocotylea and Malacocotylea, as arranged by Braun, Fischoeder, Looss, Lühe, Monticelli, Stiles and Hassall, and others:

Order. — Trematoda Rud.

Suborder II. Aspidocotylea Mont.

Family. Aspidobothridæ Burm.

Genera: Macraspis, Stichocotyle, Aspidocotylus, Platyaspis, Cotylaspis, Cotylogaster, Aspidogaster, Lophotaspis.

Suborder III. Malacocotylea Mont.

Family I. Paramphistomidæ Fisch.

Subfamily I. Paramphistominæ Fisch.

Genera: Gastrothylax, Paramphistomum, Stephanopharynx.

Subfamily II. Cladorchinæ Fisch.

Genera: Gastrodiscus, Homologaster, Diplodiscus, Cladorchis, Chiorchis.
Related genus: Balanorchis.

Family II. Fasciolidæ Rail.

Subfamily I. Fasciolinæ S. et H.

Genera: Fasciola, Fasciolopsis, Campula.
Related genera: Pleorchis, Paragonimus.

Subfamily II. Omphalometrinæ Lss.

Genera: Omphalometra, Cathæmasia.

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Subfamily III. Opisthorchiinæ Lss.

Genera: Opisthorchis, Holometra, Metorchis.
Related genus: Podocotyle.

Subfamily IV. Telorchiinæ Lss.

Genera: Telorchis, Orchidasmus.
Related genus: Deropristis.

Subfamily V. Echinostominæ Lss.

Genera: Echinostoma, Stephanochasmus, Dihemistephanus, Stephanoprora.
Related genus: Rhopalias.

Subfamily VI. Psilostominæ Pratt.

Genera: Psilostomum, Crepidastomum, Rhytidodes, Allocreadium, Calycodes, Azygia, Halicometra, Cotylotretus.
Related genera: Ptychogonimus, Orchipedum.

Subfamily VII. Anisocœlinæ Lss.

Genera: Anisocœlium, Anisogaster.

Subfamily VIII. Centrocestinæ Lss.

Genera: Centrocestus, Ascocotyle.
Related genera: Acanthochasmus, Anoiktastoma.

Subfamily IX. Cotylogoniminæ Pratt.

Genera: Cotylogonimus, Cryptocotyle.

Subfamily X. Philophthalminæ Lss.

Genera: Philophthalmus, Pygorchis.

Subfamily XI. Plagiorchiinæ Pratt.

Genera: Opisthioglyphe, Plagiorchis.
Related genera: Glossidium, Endiotrema, Pachypsolus.

Subfamily XII. Reniferinæ Pratt.

Genera: Styphlodora, Ochetosoma, Renifer, Oistosomum, Astiotrema.

Subfamily XIII. Bunoderinæ Pratt.

Genera: Bunodera, Tergestia.

Subfamily XIV. Haplometrinæ Pratt.

Genera: Haplometra, Hæmatolœchus, Ostiolum, Macrodera.
Related genera: Opisthogonimus, Asymphylodora.

Subfamily XV. Anaporrhutinæ Lss.

Genera: Anaporrhutum, Plesiorchorus.
Related genus: Callodistomum.

Subfamily XVI. Gorgoderinæ Lss.

Genera: Phyllodistomum, Gorgodera.

Subfamily XVII. Microphallinæ Ward.

Genera: Microphallus, Levinsenella.

Subfamily XVIII. Brachycœliinæ Lss.

Genera: Phaneropsolus, Lecithodendrium, Pycnoporus, Brachycœlium.
Related genera: Cymatocarpus, Brandesia.

Subfamily XIX. Pleurogenetinæ Lss.

Genera: Prosotocus, Pleurogenes, Gymnophallus, Lepidophyllum.

Subfamily XX. Cephalogoniminæ Lss.

Genera: Cephalogonimus, Emoleptalea, Prosthogonimus.
Related genus: Stromylotrema.

Subfamily XXI. Dicrocœliinæ Lss.

Genera: Dicrocœlium, Lyperosomum, Athesmia.
Related genera: Eumegacetes, Anchitrema.

Subfamily XXII. Hemiurinæ Lss.

Genera: Hemiurus, Lecithocladium, Pronopyge, Lecithochirium, Lecithaster, Liopyge, Derogenes.

Subfamily XXIII. Syncœliinæ Lss.

Genera: Progonus, Syncœlium, Otiotrema.
Related genus: Halipegus, Accacœlium, Eurycœlum.

Subfamily XXIV. Harmostominæ Lss.

Genera: Harmostomum, Ityogonimus, Glaphyrostomium, Scaphiostomum.

Subfamily XXV. Urogoniminæ Lss.

Genera: Urorygma, Urogonimus, Urotocus, Urotrema.

Subfamily XXVI. Zoögoninæ Odh.

Genera: Zoögonus, Zoögonoides.

Subfamily XXVII. Clinostominæ Pratt.

Genera: Clinostomum, Nephrocephalus.
Additional genera: Sperostoma, Microlistrum, Mesotretes, Hapalometra, Distomum.

Family III. Schistosomidæ Lss.

Genera: Schistosoma, Bilharziella, Kœllikeria.

Family IV. Holostomidæ Brds.

Subfamily I. Cyathocotylinæ Pratt.

Genus: Cyathocotyle.

Subfamily II. Diplostominæ Brds.

Genera: Diplostomum, Polycotyle.

Subfamily III. Hemistominæ Brds.

Genus: Hemistomum.

Subfamily IV. Holostominæ Brds.

Genus: Holostomum.

Family V. Gasterostomidæ Brn.

Genus: Gasterostomum.

Family VI. Didymozoönidæ Mont.

Genera: Didymozoön, Nematobothrium.

Family VII. Monostomidæ Mont.

Subfamily I. Microscaphidiinæ Lss.

Genera: Microscaphidium, Deuterobaris.

Subfamily II. Pronocephalinæ Lss.

Genera: Pronocephalus, Pleurogonius, Glyphicephalus, Adenogaster, Cricocephalus, Pyelosomum.

Related genus: Charaxicephalus.

Subfamily III. Haplorchidinæ Lss.

Genera: Haplorchis, Galactosomum.

Additional genera: Opisthotrema, Cyclocœlum, Notocotylus, Ogmogaster, Stictodora, Mesometra, Monostomum.

ORDER. — TREMATODA RUD.

Small parasitic flatworms, with unsegmented, flattened or cylindrical, unciliated bodies, with usually anterior mouth opening and bifurcate intestine, and without anal opening, which attach themselves to their hosts by means of suckers, or hooks, or both.

KEY TO THE SUBORDERS.

A_1. Usually ectoparasitic trematodes living upon the external surface or the gills, or in the mouth or cloaca of aquatic animals (except genus Polystoma), to which they attach themselves by means of suckers, or hooks, or both; suckers, when present, are usually near either one or both ends of the body; when at the anterior end, in most cases, a single pair is present; when at the posterior end, in most cases, one or more pairs are present, or, in their place, a sucking disk . . . . . Heterocotylea Mont.

A_2. Endoparasitic trematodes which attach themselves to their hosts either by means of one or more median (unpaired) suckers or a large ventral sucking disk; hooks never present.

B_1. Either a large ventral sucking disk or a mid-ventral row of suckers present; no oral sucker; intestine not bifurcate (except possibly Aspidocotylus) . . . . . Aspidocotylea Mont.

B_2. Either one or two or, in a few cases, more than two median suckers present; an oral sucker invariably present (except Gasterostomum); intestine, except in rare cases, bifurcate Malacocotylea Mont.

KEY TO THE GENERA OF THE SUBORDER ASPIDOCOTYLEA AND THE FAMILY ASPIDOBOTHRIDÆ.

a_1. A single mid-ventral row of suckers present, extending nearly or quite the length of the body, which is elongate and cylindrical.

b_1. Suckers contiguous and confluent, on a distinct ridge of the body; one testis: in gall bladder of Chimæra Macraspis Olss. (Fig. 1) (55, 66)[1]

b_2. Suckers not contiguous and not on a ridge; two testes: in gall passages of skates (as adults) and in cysts in the end-intestine of lobsters (as larvæ) . Stichocotyle Cunn. (Fig. 2) (62, 68, 66)

a_2. Very large circular or oval sucking disk present.

b_1. Sucking disk circular, containing a number of small round sucking pits; intestine possibly bifurcate: in the intestine of fresh-water fish . . . . . Aspidocotylus Dies. (Fig. 3) (58, 66)

b_2. Sucking disk circular or elliptical and containing three or four longitudinal rows of more or less rectangular depressions separated from one another by ridges.

c_1. Sucking disk with three rows of depressions.

d_1. Sucking disk irregularly circular or elliptical, with crenulate border and with transversely elongated depressions; one testis.

e_1. Number of depressions about twenty-five; marginal sense organs and eyes absent: in intestine of chelonians . . . . Platyaspis Mont. (Fig. 4) (58, 66)

e_2. Number of depressions about twenty-nine; twenty marginal sense organs and two eyes present: in mantle chamber of fresh-water mussels Cotylaspis Leidy (Fig. 5) (22, 17, 66)

d_2. Sucking disk elliptical, with very long transversely elongated median depressions and small round lateral ones; two testes; marginal sense organs: in the intestine of fish Cotylogaster Mont. (Fig. 6) (58, 66)

[1] The numbers in parentheses following the name of a genus or a species refer to the publications in the bibliography in which detailed descriptions of it may be found.

c_2. Sucking disk with four rows of depressions; one testis; marginal sense organs.

d_1. Number of depressions seventy-seven; small protrusile tentacle-like sacks at the corners of the ridges: in the stomach of sea turtles . . . . Lophotaspis Lss. (49)

d_2. Number of depressions 64–120; no protrusile sacs: in fresh-water mussels

Aspidogaster v. Baer (Fig. 7) (58, 66)

KEY TO THE FAMILIES, SUBFAMILIES, AND GENERA OF THE SUBORDER MALACOCOTYLEA.

a_3. But one sucker present (see p. 908).

a_2. Two suckers present, the oral sucker and the acetabulum, together with a large variously constructed ventral projection or disk of use in attachment (see p. 908).

a_1. Two suckers present, the oral sucker and the acetabulum, the latter either at the posterior end or in the mid-ventral surface; no other organ of attachment present.

b_1. Acetabulum at posterior end, either terminal or subterminal

Family I. Paramphistomidæ

c_1. Lateral pharyngeal pockets not present; cirrus sac absent

Subfamily I. Paramphistominæ

d_1. Genital pore opens near oral sucker into a large pouch; acetabulum terminal; body cylindrical: in herbivores

Gastrothylax Poir. (Fig. 8) (11)

d_2. Genital pouch not present; testes near center of body; ovary behind them: usually in herbivores.

e_1. Pharynx with ring-shaped projection near its hinder end; intestine long and serpentine

Stephanopharynx Fisch. (11)

e_2. Pharynx without ring-shaped projection; body conical; acetabulum subterminal

Paramphistomum Fisch. (Fig. 9) (11)

c_2. Lateral pharyngeal pockets present; cirrus sac present

Subfamily II. Cladorchinæ

d_1. Ventral surface with numerous papillæ.

e_1. Acetabulum minute and subterminal; body made up of two portions, a slender anterior portion and a very broad, disklike posterior portion, which contains numerous papillæ on its concave ventral surface: in intestines of herbivores Gastrodiscus Leuck. (Fig. 10) (11)

e_2. Acetabulum large and subterminal; entire ventral surface covered with papillæ: in intestine of mammals

Homologaster Poir. (Fig. 11) (11)

d_2. No ventral papillæ present.
e_1. Testes simple, not lobate or dendritic.
f_1. Acetabulum terminal with excretory pore in its center; testes often fused to form a single body: in the rectum of amphibians
Diplodiscus Dies. (Fig. 12) (41)
f_2. Excretory pore not in acetabulum; testes in extreme hinder part of body with ovary in front of one of them; genital pore with a muscular fold around it; very small worms: in the stomach of herbivores . . . . . Balanorchis Fisch. (11)
e_2. Testes dendritic, near center of body.
f_1. Intestine long and serpentine; no bulblike widening of œsophagus; ovary near acetabulum: in mammals . . . . . Cladorchis Fisch. (11)
f_2. Intestine straight; œsophagus with bulblike widening; ovary behind testes, which lie one behind the other and are each cross shaped
Chiorchis Fisch. (11)
b_2. Acetabulum in the mid-ventral surface, but not at posterior end.
c_1. Worms hermaphroditic . . . . . Family II. Fasciolidæ
d_3. Ovary between testes (see p. 906).
d_2. Ovary behind testes (see p. 903).
d_1. Ovary in front of testes.
e_1. Uterus does not extend back of testes.
f_1. Intestinal cœca long and with lateral projections; yolk glands very voluminous: usually in the liver or lungs of mammals Subfamily I. Fasciolinæ
g_1. Worms of large size, broad and leaf-like; acetabulum near anterior end; intestinal cœca, testes, and ovary profusely branched.
h_1. Body elongate; anterior end conical and more or less set off from remainder of worm . Fasciola L. (Fig. 13) (44, 83)
h_2. Body circular
Fasciolopsis Lss. (Fig. 14) (44)
g_2. Worms not of large size; lateral branches of intestinal cœca short and few.
h_1. Testes two, one behind the other: in liver of Cetacea
Campula Cob. (Fig. 15) (4, 86)
h_2. Testes numerous, in two longitudinal rows; intestinal cœca with but two branches, which pass anteriad: in fish
Pleorchis Rail. (Fig. 16) (86)

f_2. Intestinal cœca without lateral projections.

g_1. Genital pore immediately behind acetabulum (but not on a papilla); body thick and egg-shaped; intestinal cœca long; testes lobate, in same transverse plane; yolk glands very large; uterus very small, near acetabulum: in lungs of mammals
Paragonimus Brn. (Fig. 17) (87)

g_2. Genital pore in front or at left side of acetabulum or, if behind, on a papilla.

h_1. Yolk glands dendritic, *i.e.*, diffuse and not compact.

i_1. Either a ring of spines or two spiny, retractile tentacles at anterior end.

j_1. Testes in same transverse plane behind acetabulum; mouth surrounded by spines.

k_1. Testes and yolk glands near middle of body, which is broad Anoiktastoma Stoss. (Fig. 18) (44)

k_2. Testes and ovary at extreme hinder end of body: in small intestine of birds and mammals
Subfamily VIII. Centrocestinæ

l_1. Intestinal cœca long; œsophagus wanting; testes and yolk gland large
Centrocestus Lss. (Fig. 19) (44)

l_2. Intestinal cœca short, not reaching acetabulum; œsophagus long; a dorsal lip over mouth; oral sucker prolonged posteriorly into a long, blind sac Ascocotyle Lss. (Fig. 20) (44)

j_2. Testes one behind the other, not in same transverse plane.

k_1. Two spiny, retractile tentacles present, one on either side of mouth: in the opossum
Rhopalias S. et H. (Fig. 21) (86, 7)

k_2. Tentacles not present; body usually elongate and cylindrical; mouth surrounded by spines.

l_1. Testes and ovary close together in extreme hinder end of body; oral sucker large and surrounded by a single row of spines: in reptiles and fish
Acanthochasmus Lss. (Fig. 22) (44, 48)

l_2. Testes and ovary usually not all close together and not in extreme hinder part of body, although in posterior half.

m_1. Intestinal cœca do not reach to end of body and not of equal length; testes elongate; mouth surrounded by a single row of spines: in intestine of fish
Subfamily VII. Anisocœlinæ

n_1. Testes very small and elongate and in center of body; ovary lobate; uterus does not extend to end of intestinal cœca
Anisocœlium Lühe (Fig. 23) (52)

n_2. Testes elliptical, in hinder half of body; ovary spherical; uterus extends to end of body
Anisogaster Lss. (Fig. 24) (49)

m_2. Intestinal cœca extend to end of body, or nearly so, and are of equal length Subfamily V. Echinostominæ

n_1. Mouth surrounded by a single row of spines.

o_1. Oral spines set in a more or less reniform ridge and interrupted mid-ventrally
Echinostoma R. (Fig. 25) (44)

o_2. Oral spines not set in a ridge or interrupted ventrally; a number of unusually large spines just back of mouth: in crocodiles
Stephanoprora Odh. (71)

n_2. Mouth surrounded by a double row of spines.

o_1. Spines entirely surround mouth; long prepharynx present: in fish
Stephanochasmus Lss. (Fig. 26) (44, 48)

o_2. No spines on ventral side of mouth, but a little back of this is a group of short spines
Dihemistephanus Lss. (Fig. 27) (48)

i_2. Neither a ring of spines nor tentacles present at anterior end.

j_1. Testes two in number, one behind the other, often obliquely, but never in same transverse plane; body usually elongate.

k_1. Ovary separated from one or both testes by half the length of the body, the space being filled by the uterus; cirrus sac very long: in turtles . . . . Subfamily IV. Telorchiinæ

l_1. Both testes at extreme hinder end of body
Telorchis Lühe (Fig. 28) (50, 10)

l_2. One testis at extreme hinder end and one near ovary
Orchidasmus Lss. (Fig. 29) (44, 45)

k_2. Ovary not widely separated from testes; uterus usually in front of ovary.

l_1. Excretory vesicle Y-shaped, with very long stem, which winds between the testes; receptaculum seminis large; no cirrus sac: in the liver of mammals, birds, and reptiles
Subfamily III. Opisthorchiinæ

m_1. Yolk glands do not extend forward of acetabulum; uterus confined between intestinal cœca
Opisthorchis R. Bl. (Fig. 30) (44)

m_2. Yolk glands partly or wholly in front of acetabulum; uterus usually overlapping intestinal cœca.

n_1. Yolk glands entirely in front of acetabulum; uterus extends back of ovary to testes
Holometra Lss. (Fig. 31) (44)

n_2. Yolk glands partly behind acetabulum
Metorchis Lss. (Fig. 32) (44)

l_2. Stem of excretory vesicle usually entirely posterior to testes: cirrus sac present.

m_1. Testes lobate; prepharynx present
Subfamily II. Omphalometrinæ

n_1. Œsophagus absent; intestinal cœca do not extend into extremity of body; yolk glands meet in median line: in Ciconia
Omphalometra Lss. (Fig. 33) (44)

n_2. Œsophagus present.

o_1. Acetabulum pedunculate; ovary lobate; uterus extends in zigzags to genital pore; yolk glands meet in median line
Podocotyle Stoss. (51)

o_2. Ovary spherical; acetabulum sessile; uterus massed between them; yolk glands laterad of intestinal cœca
Cathæmasia Lss. (Fig. 34) (44)

m_2. Testes not lobate.

n_1. Yolk glands extend in front of acetabulum.

o_1. Anterior end with projecting ridges or with six papillæ.

p_1. Body subcylindrical; anterior end with four projecting, radial ridges: in turtles
Calycodes Lss. (Fig. 35) (49)

p_2. Anterior end with six papillæ, two being ventral and four dorsal: in fish
Crepidastomum Brn. (8)

o_2. Anterior end without ridges or papillæ; body broad and flat.

p_1. Yolk glands very extensive, overlapping intestinal cœca; ovary near testes and not near acetabulum: in fish
Halicometra Odh. (Fig. 104) (70)

p_2. Yolk glands not overlapping intestinal cœca: in amphibians
Opisthioglyphe Lss. (Fig. 47) (44)

n_2. Yolk glands do not extend in front of acetabulum
Subfamily VI. Psilostominæ

o_1. A pair of earlike papillæ present near mouth; body elongate.

p_1. Acetabulum small; testes ovoid: in turtles
Rhytidodes Lss. (Fig. 36) (49)

p_2. Acetabulum very large; testes reniform: in *Spilotes pullatus*, a Brazilian snake
Cotylotretus Odh. (Fig. 130) (71)

o_2. Anterior papillæ absent.

p_1. Anterior portion of body covered with large spines and often inflated; remainder of body with small spines: in fish
Deropristis Odh. (Fig. 105) (70)

p_2. No large anterior spines.

q_1. Œsophagus long; uterus short; receptaculum seminis and testes large: in fish
Allocreadium Lss. (Fig. 37) (44, 45)

q_2. Œsophagus very short or wanting; receptaculum seminis absent or small.

r_1. Yolk glands extend back of testes.

s_1. Large suckerlike genital papilla present in front of acetabulum; uterus extends to end of body
Ptychogonimus Lühe (Fig. 38) (51)

s_2. No genital papilla present; uterus short, in front of testes; prepharynx present; in birds and fish
Psilostomum Lss. (Fig. 39) (44)

r_2. Yolk glands do not extend back of testes; ovary far from acetabulum, the space between filled by the uterus; body elongate: in fish
Azygia Lss. (Fig. 40) (44)

j_2. Testes either two in number, in same transverse plane in hinder end of body, or many in number.

k_1. Testes numerous, in median field of body; no pharynx present; ovary just back of acetabulum: in ducks
Orchipedum Brn. (9)

k_2. Testes two in number, in same transverse plane
Subfamily IX. Cotylogoniminæ

l_1. Genital pore in acetabulum; yolk glands very voluminous: in birds . . . Cryptocotyle Lühe (Fig. 41) (50, 10)

l_2. Genital pore on a muscular suckerlike papilla at posterio-lateral side of acetabulum; œsophagus long; yolk glands small: in mammals
Cotylogonimus Lühe (Fig. 42) (50, 10)

h_2. Yolk glands compact, and lobate or tubular; worms oval or elliptical in shape; suckers large and often projecting; testes in extreme hinder end of body; cirrus sac long: in birds . . . . . Subfamily X. Philophthalminæ

i_1. Cirrus sac extends back of acetabulum; yolk glands tubular, laterad of intestinal cœca: under the eyelid of birds . . Philophthalmus Lss. (Fig. 43) (44)

i_2. Cirrus sac does not extend back of acetabulum; yolk glands lobate, not laterad of intestinal cœca: in cloaca of birds . . Pygorchis Lss. (Fig. 44) (44)

e_2. Uterus extends back of testes, usually to end of body.

f_1. Intestinal cœca long, extending more than half the length of body.

g_1. Ovary immediately behind or at side of acetabulum, or when not near it the intestinal cœca do not extend into hinder extremity of body.

h_1. Genital pore near the acetabulum or somewhere in front of it, but not at the extreme anterior or posterior end of body.

i_1. Mouth surrounded by papilla-like or long spinelike projections . . . . Subfamily XII. Bunoderinæ

j_1. Mouth surrounded by six contractile projections; no spines present; uterus consists of a descending and an ascending branch, without spinal windings: in fish
Bunodera Rail. (Fig. 45) (44, 86)

j_2. Mouth surrounded by long spinelike projections; uterus winds spirally: in Belone
Tergestia Stoss. (Fig. 46) (44)

i_2. No projections surrounding mouth.

j_1. Intestinal cœca usually do not reach the end of the body (longest in Opisthioglyphe); body usually spiny; excretory canal usually Y-shaped; cirrus sac present
Subfamily XI. Plagiorchiinæ

k_1. Uterus does not extend back of testes; œsophagus long; ovary at side of acetabulum: in amphibians
Opisthioglyphe Lss. (Fig. 47) (44)

k_2. Uterus extends back of testes.

l_1. Œsophagus wanting.

m_1. Yolk glands extend forward of the acetabulum.
n_1. Testes not in same transverse plane; cirrus sac extends back of acetabulum: in amphibians, reptiles, and birds Plagiorchis Lühe (Fig. 48) (50, 10)
n_2. Testes in same transverse plane.
o_1. Cirrus sac extends far back of acetabulum: in turtles Pachypsolus Lss. (Fig. 49) (49)
o_2. Cirrus sac extends to middle of acetabulum; body divided into two parts: in crocodiles Oistosomum Oldh. (71)
m_2. Yolk glands do not extend in front of acetabulum; body elongate, tapering to posterior end, which is truncated: in fish Glossidium Lss. (Fig. 50) (44)
l_2. Œsophagus present.
m_1. Body covered with minute spines or scales.
n_1. Testes not in same transverse plane.
o_1. One intestinal cœcum much longer than the other; testes elongate; a single row of spines around mouth: in fish Subfamily VII. Anisocœlinæ
p_1. Testes very small, in center of body; ovary lobate; uterus does not extend to end of intestinal cœca Anisocœlium Lühe (Fig. 23) (52)
p_2. Testes in hinder half of body; ovary spherical; uterus extends to end of body Anisogaster Lss. (Fig. 24) (48)
o_2. Intestinal cœca of equal length.
p_1. Oral sucker larger than acetabulum; yolk glands extend in front of latter; stem of excretory vesicle very long, winding between testes; receptaculum seminis minute; cirrus sac long: in aquatic vertebrates Astiotrema Lss. (Fig. 51) (44, 45)
p_2. Oral sucker smaller than acetabulum; yolk glands do not extend in front of latter; testes lobate; receptaculum seminis large; stem of excretory vesicle short: in reptiles Styphlodora Lss. (Fig. 52) (44, 77)
n_2. Testes in nearly or quite the same transverse plane and lobate; oral sucker smaller than acetabulum; yolk glands extend about to acetabulum; receptaculum seminis absent or minute; stem of excretory vesicle very long: in reptiles Renifer Pratt (Fig. 53) (77)

m_2. Body not spiny; cirrus sac very wide in front of acetabulum; yolk glands composed of a single row of follicles on each side: in turtles

Endiotrema Lss. (Fig. 54) (44, 45)

j_2. Intestinal cœca reach into extremity of body; testes usually in oblique plane or one behind the other.

k_1. Large suckerlike genital papilla present in front of acetabulum; suckers large; excretory crura join at anterior end

Ptychogonimus Lühe (Fig. 38) (51)

k_2. No genital papilla present . Subfamily XIV. Haplometrinæ

l_1. Genital pore just behind pharynx; cirrus sac very long and narrow.

m_1. Acetabulum larger than and near oral sucker; body elongate; testes and ovary in forward half of body; receptaculum seminis wanting or minute

Macrodera Lss. (44)

m_2. Acetabulum smaller than oral sucker and not near it; uterus very long and deeply colored; receptaculum seminis very large; Laurer's canal wanting; œsophagus wanting or short.

n_1. Uterus in long longitudinal folds; ovary beside acetabulum: in lungs of amphibians

Hæmatolœchus Lss. (Fig. 55) (44)

n_2. Uterus in transverse folds; ovary behind acetabulum, which is minute; testes very large: in frogs

Ostiolum Pratt (Fig. 56) (77)

l_2. Genital pore near acetabulum.

m_1. Genital pore just in front of acetabulum.

n_1. Œsophagus present.

o_1. Pharynx present.

p_1. Yolk glands extensive and dendritic; body elongate: in amphibians

Haplometra Lss. (Fig. 57) (44)

p_2. Yolk glands small, on each side of acetabulum; testes in same transverse plane just behind them; ovary to right of and just behind acetabulum; body broad: in fish

Callodistomum Odh. (70)

o_2. Pharynx absent; body broad; yolk glands very small lobate bodies just behind acetabulum

Phyllodistomum Brn. (Fig. 63) (8)

n_2. Œsophagus absent; body very broad; testes a large number of small round bodies

Anaporrhutum Ofen. (Fig. 64) (67)

m_2. Genital pore behind and to left of acetabulum; cirrus sac U-shaped: in snakes
Opisthogonimus Lühe (Fig. 58) (50, 10)

h_2. Genital pore at the extreme anterior or posterior end of the body.

i_1. Genital pore in front of or at side of oral sucker
Subfamily XX. Cephalogoniminæ

j_1. Testes one behind the other; cirrus sac very long.

k_1. Excretory vesicle large, with long stem and crura, both of which throw out side branches; genital pore in front of oral sucker
Cephalogonimus Poir. (Fig. 59) (44)

k_2. Excretory vesicle with long stem, short crura, and without side branches; genital pore at right of oral sucker: in fish Emoleptalea Lss. (Fig. 60) (44, 45)

j_2. Testes in nearly same transverse plane and lobate; genital pore at left of oral sucker; ovary lobate: in birds
Prosthogonimus Lühe (Fig. 61) (50, 10)

i_2. Genital pore at extreme hinder end of body; testes and ovary in median line, the latter just behind acetabulum, the former just in front of cirrus sac with the uterus between: in bats
Urotrema Brn. (9)

g_2. Ovary not immediately behind or at side of acetabulum; intestinal cœca extend to end of body.

h_1. Genital pore in front of acetabulum and median; yolk glands small, being spherical, lobate, or dendritic bodies near the middle of the body.

i_1. Yolk glands spherical; excretory crura join near the pharynx; acetabulum large . . . . Liopyge Lss. (Fig. 88) (44)

i_2. Yolk glands lobate or dendritic.

j_1. Pharynx absent; yolk glands small and lobate: in urinary bladder of cold-blooded vertebrates
Subfamily XVI. Gorgoderinæ

k_1. Body elongate; either one pair of testes or four testes on one side and five on the other
Gorgodera Lss. (Fig. 62) (44)

k_2. Body broad and leaflike; one pair of testes
Phyllodistomum Brn. (Fig. 63) (8)

j_2. Pharynx present; body broad and leaflike; testes either numerous or two in number Subfamily XV. Anaporrhutinæ

k_1. Testes made up of a large number of small bodies; yolk glands small and dendritic; uterus not laterad of intestinal cœca Anaporrhutum Ofen. (Fig. 64) (67)

k_2. Testes two large, lobate bodies; yolk glands lobate; uterus extends laterad of intestinal cœca: in turtles
Plesiorchorus Lss. (Fig. 65) (46)

h_2. Genital pore on edge of body.

i_1. Genital pore on right edge of body opposite pharynx; suckers very large; testes in same transverse plane in front of acetabulum: in birds
Stromylotrema Lss. (Fig. 66) (44, 45)

i_2. Genital pore on left edge of body opposite acetabulum; but one testis present: in fish
Asymphylodora Lss. (Fig. 67) (44)

f_2. Intestinal cœca very short, extending but little, if any, beyond the acetabulum, and often not to it; excretory vesicle usually wide, long, and V- or Y-shaped; testes usually in same transverse plane.

g_1. Intestinal cœca reach about to acetabulum or a little beyond, and are usually longer than the œsophagus; yolk glands small . . . . . Subfamily XIX. Pleurogenetinæ

h_1. Genital pore at left side of body near forward end; cirrus sac large.

i_1. Testes small, lobate, just behind yolk glands and ovary, all being behind acetabulum: in fish
Lepidophyllum Odh. (Fig. 106) (70)

i_2. Yolk glands and ovary in front of testes: in amphibians and reptiles.

j_1. Testes one on each side of acetabulum; œsophagus long; body elliptical
Pleurogenes Lss. (Fig. 68) (43, 44)

j_2. Testes far in front of acetabulum and ovary; body oval or round; œsophagus short
Prosotocus Lss. (Fig. 69) (44)

h_2. Genital pore in or very near acetabulum.

i_1. Genital pore in anterior border of acetabulum; excretory vesicle Y-shaped and very long
Gymnophallus Odhner (Fig. 70) (69)

i_2. Genital pore not in acetabulum.

j_1. Genital pore at left side of acetabulum; yolk glands behind testes
Levinsenella S. et H. (Fig. 71) (44, 15)

j_2. Genital pore in front of acetabulum; yolk glands in front of testes: in Corone
Ochetosoma Brn. (9)

g_2. Intestinal cœca very short, usually falling short of acetabulum; ovary usually near acetabulum; yolk glands small; testes usually in same transverse plane
Subfamily XVII. Brachycœliinæ

h_1. Body elongate and spiny.

i_1. Acetabulum small, about size of oral sucker ; cirrus sac large and extending back of acetabulum ; yolk glands dendritic, extending in front of acetabulum : in turtles

Cymatocarpus Lss. (Fig. 72) (44)

i_2. Acetabulum very large ; cirrus sac small, in front of acetabulum ; yolk glands lobate, behind acetabulum : in amphibians and reptiles

Brachycœlium Duj. (Fig. 73) (44)

h_2. Body short, oval, usually spiny.

i_1. Testes behind and ovary to right of acetabulum.

j_1. Genital pore median, in front of acetabulum ; yolk glands, one on each side of acetabulum : in bats

Pycnoporus Lss. (Fig. 74) (44)

j_2. Genital pore at left side of acetabulum

Subfamily XVII. Microphallinæ

k_1. Yolk glands lobate, in hinder part of body ; vesicula seminalis large, in front of acetabulum ; no spines : in fresh-water fish

Microphallus Ward (Fig. 75) (92, 94)

k_2. Intestinal cœca reach a little beyond acetabulum ; spines present

Levinsenella S. et H. (Fig. 71) (44, 15)

i_2. Testes in front of or on each side of acetabulum.

j_1. Genital pore median, between oral sucker and acetabulum ; testes one on each side of and ovary to left of acetabulum.

k_1. Genital pore near acetabulum ; œsophagus long ; yolk glands behind acetabulum ; no cirrus sac : in bats and chameleons

Lecithodendrum Lss. (Fig. 76) (44)

k_2. Genital pore near pharynx ; œsophagus short ; yolk glands far in front of acetabulum ; long cirrus sac present : in birds and mammals

Phaneropsolus Lss. (Fig. 77) (44)

j_2. Genital pore at left side of body ; acetabulum in hinder part of body ; all the genital glands in front of them ; œsophagus short : in frogs

Brandesia Stoss. (Fig. 78) (44)

d_2. Ovary behind testes.

e_1. Testes in front of acetabulum, in same transverse plane.

f_1. Ovary behind acetabulum; suckers large; genital pore near pharynx; no œsophagus present: in cloaca of birds
Eumegacetes Lss. (Fig. 79) (44, 45)

f_2. Ovary in front of acetabulum; suckers not large.

g_1. Genital pore at extreme hinder end: in birds
Urorygma Brn. (9)

g_2. Genital pore in front of acetabulum; intestinal cœca not reaching acetabulum.

h_1. Genital pore median.

i_1. Cirrus sac long; yolk glands in front of acetabulum: in birds and mammals
Phaneropsolus Lss. (Fig. 77) (44)

i_2. No cirrus sac; yolk glands behind acetabulum: in bats and chameleons
Lecithodendrium Lss. (Fig. 76) (44)

h_2. Genital pore on left edge of body; cirrus sac long; genital glands all in front of acetabulum: in amphibians and reptiles
Prosotocus Lss. (Fig. 69) (44)

e_2. Testes behind acetabulum.

f_1. Yolk glands dendritic and along the sides of the body.

g_1. Testes one behind the other; body elongate; intestinal cœca extending to end of body.

h_1. Yolk glands consist of a series of branched tubular follicles on each side.

i_1. Œsophagus very long; each intestinal cœcum sends a long projection forward, giving the digestive tract the form of an H; acetabulum often pedunculate: in fish
Accacœlium Mont. (Fig. 80) (44, 59)

i_2. Acetabulum not pedunculate; digestive tract not in form of an H; acetabulum in middle of body, the anterior half of which is flat, the posterior half cylindrical
Eurycœlum Brock. (55)

h_2. Yolk glands not of tubular follicles, but of spheroidal masses; œsophagus short; suckers near together: usually in the liver Subfamily XXI. Dicrocœliinæ

i_1. But one yolk gland, the left one, present: in liver of birds . . . Athesmia Lss. (Fig. 81) (44)

i_2. A pair of yolk glands present.

j_1. Body flat and leaf-like
Dicrocœlium Duj. (Fig. 82) (44, 86)

j_2. Body cylindrical
Lyperosomum Lss. (Fig. 83) (44)

g_2. Testes in same transverse plane or nearly so; intestinal cœca extend to end of body; excretory canal Y-shaped; cirrus sac wanting: in bats and chameleons

Anchitrema Lss. (44)

f_2. Yolk glands compact, or if dendritic, of small extent and not along the sides of the body.

g_1. Genital pore in front of acetabulum.

h_1. Yolk glands in hinder end of body.

i_1. Distal ends of intestinal cœca joined; distal ends of excretory crura also joined: in marine fish

Subfamily XXIII. Syncœliinæ

j_1. Yolk glands compact, spherical; testes in same transverse plane: in the stomach

Progonus Lss. (Fig. 84) (44)

j_2. Yolk glands dendritic: on gills of sharks.

k_1. Intestinal cœca have side branches; testes and ovary dentritic; acetabulum pedunculate; anterior portion of body cylindrical, posterior flat and folded

Otiotrema Setti (Fig. 85) (44)

k_2. Intestinal cœca without side branches; ovary deeply lobate; testes in two longitudinal rows of isolated lobes

Syncœlium Lss. (Fig. 86) (44)

i_2. Distal ends of intestinal cœca not joined; testes usually in same transverse plane in hinder end of body; uterus in transverse folds, passing to anterior end of body: in amphibians

Halipegus Lss. (Fig. 87) (44)

h_2. Yolk glands near or towards the middle of the body (except Derogenes); excretory crura usually joining over the pharynx; small cylindrical or elliptical forms, in most of which the hinder end of the body is telescopic: in marine fish

Subfamily XXII. Hemiurinæ

i_1. Hinder end of body not telescopic (no appendix); genital pore near branching of intestine.

j_1. Testes behind ovary and diagonally behind each other; yolk glands in front of ovary; all genital glands spherical

Liopyge Lss. (Fig. 88) (44)

j_2. Testes in front of ovary, in nearly same transverse plane; yolk glands lobate and behind ovary

Derogenes Lühe (Fig. 89) (52, 55)

i_2. Hinder end of body telescopic (with appendix).

j_1. Body elongate, finely ringed.

k_1. Yolk glands spherical, behind ovary; appendix either long, medium, or short; receptaculum seminis large

Hemiurus R. (Fig. 90) (44, 55, 57, 76)

k_2. Yolk glands composed of three or four long, involved tubes on each side; appendix long

Lecithocladium Lühe (Fig. 91) (55)

j_2. Body fusiform or ovate; not ringed.

k_1. Yolk glands spherical, near acetabulum; excretory crura do not join anteriorly; testes in same transverse plane; appendix very short

Pronopyge Lss. (Fig. 92) (44)

k_2. Yolk glands deeply lobate or tubular, behind testes.

l_1. Yolk glands apparently joined to form a single star-shaped body

Lecithaster Lühe (Fig. 93) (55)

l_2. Yolk glands distinctly separate from each other, and each composed of three or four tubular lobes

Lecithochirium Lühe (Fig. 94) (55)

g_2. Genital pore on left edge of body nearly opposite acetabulum; but one yolk gland present, a small ovoid structure in center of the body; testes in same transverse plane: in fish . . . . . Subfamily XXVI. Zoögoninæ

h_1. Testes just back of acetabulum; yolk gland just in front of ovary . . Zoögonus Lss. (Fig. 95) (47)

h_2. Testes one on each side of acetabulum; yolk gland just behind ovary

Zoögonoides Odh. (Fig. 96) (70)

d_3. Ovary between the testes, which are often one behind the other.

e_1. Genital pore in front of acetabulum; suckers large; œsophagus and intestinal cœca long; testes and cirrus sac large; yolk glands extensive, along entire sides of body: in fish

Spærostoma R. (Fig. 97) (44, 86)

e_2. Genital pore behind acetabulum.

f_1. Genital pore at hinder extremity of body: œsophagus absent; yolk glands voluminous: in birds and bats

Subfamily XXV. Urogoniminæ

g_1. Suckers very large; testes obliquely behind each other; body broad . . . Urogonimus Mont. (Fig. 98) (44)

g_2. Suckers not large; testes directly behind one another; body elongate . . Urotocus Lss. (Fig. 99) (44)

f_2. Genital pore not at hinder extremity of body but usually near testes.

g_1. Genital pore between testes, which are very large and broken up into a large number of distinct parts; no pharynx, a long œsophagus, and long intestinal cœca present: in sea turtles

Hapalotrema Lss. (Fig. 100) (44)

g_2. Testes not broken into small parts.

h_1. Mouth surrounded by circular ridge; intestine usually with short lateral projections

Subfamily XXVII. Clinostominæ

i_1. Genital pore just in front of testes; pharynx absent: in mouth of birds

Clinostomum Leidy (Fig. 101) (21, 6)

i_2. Genital pore a short distance in front of posterior end; pharynx present: in crocodiles

Nephrocephalus Odh. (71)

h_2. Mouth not surrounded by ridge

Subfamily XXIV. Harmostominæ

i_1. Genital pore in front of anterior testis.

j_1. Body linguiform; mouth a slit; ovary and testes in extreme hinder end: in mammals

Harmostomum Brn. (Fig. 102) (10)

j_2. Body very elongate and cylindrical; genital glands not in extreme hinder end: in birds . . . Scaphistomum Brn. (9)

i_2. Genital pore between the testes.

j_1. Body very elongate, tapelike; acetabulum very small; oral sucker large; genital pore near forward end of hinder testis; testes far apart: in Talpa

Ityogonimus Lühe (Fig. 103) (50, 10)

j_2. Body elongate, linguiform; genital pore just behind anterior testis; mouth circular: in Mycotheria from Brazil

Glaphyrostomum Brn. (9)

c_2. Worms diœcious . . . . . Family III. Schistosomidæ

d_1. Hinder portion of body expanded in both sexes; female shorter than male: in the blood and liver of birds . Bilharziella Lss. (44)

d_2. Body cylindrical in both sexes or expanded in female.

e_1. Female longer than male and filiform, and enclosed in the gynæcophoric canal of the latter: in the blood of mammals

Schistosoma Wein. (Fig. 107) (44)

e_2. Male and anterior portion of female filiform; posterior portion of female swollen and reniform: in the mouth and gill clefts of fish, living in cysts, a male and a female being in a cyst . Kœllikeria Cob. (Fig. 108) (86)

a_2. Two suckers present, the oral sucker and the ventral acetabulum, together with a large, variously constructed ventral projection, or disk, of use in attachment . . . . . Family IV. Holostomidæ

b_1. Body circular, not made up of two portions; acetabulum usually covered by a large disklike structure which possesses a large cavity extending itself into a longitudinal groove: in intestine of birds . . . . . Cyathocotyle Mühl. (Fig. 109) (60)

b_2. Body elongate and made up of two distinct portions, the anterior portion being usually flattened and containing the acetabulum and the special organ of attachment.

c_1. Lateral edges of anterior portion not bent ventrally; special organ of attachment an elongated depression lined with papillæ . . . . . Subfamily II. Diplostominæ

d_1. A row of mid-dorsal suckers on hinder part of body: in intestine of the alligator
Polycotyle Will.-S. (Fig. 110) (95)

d_2. No dorsal suckers: in intestine of reptiles and birds
Diplostomum v. Nord. (Fig. 111) (3)

c_2. Lateral edges of anterior portion bent ventrally.

d_1. Anterior portion trough-shaped; special organ of attachment an elongated elevation, which may project over the acetabulum.

e_1. In birds and land mammals
Hemistomum Dies. (Fig. 112) (3)

e_2. In Delphinus . . . . . Braunina Heider (12)

d_2. Lateral edges of anterior portion meet and fuse mid-ventrally, making this part of the body cup-shaped; special organ of attachment a conical projection: usually in birds . . . . . Holostomum Nit. (Fig. 113) (3)

a_3. But one sucker present and no other organ of attachment.

b_1. Mouth in the middle of the ventral body surface; sucker at anterior end; intestine not bifurcate; genital and excretory pores at posterior end: in the intestine of fish
Gasterostomum v. Sieb. (Fig. 114) (33)

b_2. Mouth at anterior end, sucker oral.

c_1. Worms found in pairs in cysts on the gills, outer surface, or in the mouth of fish; intestine often rudimentary or wanting
Family VI. Didymozoönidæ

d_1. Anterior portion of body slender and cylindrical, posterior portion thick and cylindrical, or reniform
Didymozoön Tasch. (Fig. 115) (3)

d_2. Body very elongate (up to a meter in length) and filiform; intestine wanting but mouth present . . Nematobothrium v. Ben. (3)

c_2. Worms not found in pairs enclosed in cysts Family VII. Monostomidæ

d_1. Testes directly behind one another in middle of body; ovary behind them; body usually elongate, anterior end not set off; genital pore near anterior end; cirrus sac wanting; uterus not voluminous; intestinal cœca do not extend to end of body: in intestine of reptiles . . . . . Subfamily I. Microscaphidiinæ

e_1. Uterus confined between intestinal cœca
Microscaphidium Lss. (Fig. 116) (44, 45)

e_2. Uterus overlaps intestinal cœca
Deuterobaris Lss. (Fig. 117) (44, 45)

d_2. Testes either in same transverse plane or obliquely behind one another; ovary usually in front of testes or between them.

e_1. Genital pore at hinder end of body, which is broad; pharynx wanting: in Halicore Opisthotrema Leuck. (Fig. 118) (3)

e_2. Genital pore in anterior half of body.

f_1. Intestinal cœca join at their hinder ends; testes obliquely behind one another: in water birds
Cyclocœlum Brds. (Fig. 119) (44)

f_2. Intestinal cœca not thus joined.

g_1. Anterior end more or less triangular, being set off by a circular muscular ridge from rest of body; testes and ovary often lobate in hinder end of body: in marine turtles . . . . . Subfamily II. Pronocephalinæ

h_1. Anterior ridge with a deep indentation on the ventral side.

i_1. Ovary in front of testes, of which two are present.

j_1. Intestinal cœca without side projections and with their posterior ends laterad of the testes; latter not in same transverse plane
Pronocephalus Lss. (Fig. 120) (44)

j_2. Intestinal cœca with side projections and with their posterior ends mediad of testes, which are in same transverse plane.

k_1. Ventral surface with four longitudinal rows of groups of glands
Adenogaster Lss. (49)

k_2. No ventral glands.

l_1. Anterior circular ridge very high; vesicula seminalis very long and winding skeinlike outside the cirrus sac
Glyphicephalus Lss. (49)

l_2. Anterior ridge not noticeably high; vesicula seminalis not skeinlike Pleurogonius Lss. (Fig. 121) (49)

i_2. Ovary behind testes, of which about fifteen are present, arranged in two longitudinal parallel rows Charaxicephalus Lss. (49)

h_2. Anterior circular ridge without ventral indentation; intestinal cœca with numerous side projections; testes and ovary deeply lobate in hinder end of body.

i_1. Hinder end of body truncated or concave; cirrus sac long and with vesicular seminalis extending the greater part of the length of the body . Cricocephalus Lss. (Fig. 122) (44)

i_2. Hinder end of body rounded; cirrus sac in transverse plane Pyelosomum Lss. (Fig. 123) (44)

g_2. Anterior end not set off from rest of body.

h_1. Longitudinal ridges or rows of glands on ventral surface; testes in same transverse plane in hinder part of body.

i_1. Three rows of glands on ventral surface; intestinal cœca long and without projections; ovary between testes: in birds Notocotylus Dies. (Fig. 124) (44)

i_2. About fifteen longitudinal ridges on ventral surface; cirrus sac very large: in intestine of cetaceans Ogmogaster Jäg. (Fig. 125) (3)

h_2. Ventral surface without ridges or rows of glands.

i_1. Yolk glands laterad of intestinal cœca in hinder portion of body; testes in oblique plane.

j_1. Ovary between testes; intestinal cœca very narrow; uterus extends to end of body: in birds Stictodora Lss. (Fig. 126) (44)

j_2. Ovary in front of testes; intestinal cœca broad; uterus in front of ovary: in fish Galactosomum Lss. (Fig. 127) (44)

i_2. Yolk glands on both sides of intestinal cœca in middle and hinder part of body.

j_1. But one testis present; ovary in front of it: in Bagrus Haplorchis Lss. (Fig. 128) (44)

j_2. Testes in same transverse plane: ovary behind them; intestinal cœca enclose both; body circular or oval: in Box Mesometra Lühe (Fig. 129) (54)

(*To be continued*)